APPENDIX S1: Additional Image Segmentation and Elastography and Echogenicity Measures

Additional image segmentations and elastography and echogenicity measures were performed on stenotic-free segments of the index internal carotid artery (Table S2). For each index plaque of patients with symptomatic or asymptomatic stenosis, we identified an area of the vessel wall without plaque on additional radiofrequency imaging views (i.e., the distal segment with respect to the position of the stenosis). For five subjects, the area of the internal carotid wall without plaque could not be segmented because of poor image quality. Elastography and echogenicity indexes computed within the segmented area of all available image frames were compared between patients with symptomatic stenosis and those with asymptomatic stenosis by use of unpaired *t* tests or Mann-Whitney tests when applicable. Statistically significant differences between subjects with symptomatic stenosis and those with asymptomatic stenosis were observed for the cumulated axial shear strain magnitude only; statistically significantly differences were not noted for other elastography and echogenicity indexes. The finding of a smaller cumulated shear strain in patients with symptomatic stenosis is consistent with a higher vascular rigidity, even if it is an equivocal finding because it was observed for just one elastography parameter and the *p* value was barely significant ($p = 0.043$). As also seen in Table S2, the normal internal carotid artery wall of patients with symptomatic stenosis tends to have a higher percentage of low-intensity gray level; however, this finding was not significant ($p = 0.053$).

The relationship between elastography and echogenicity parameters or plaque areas was also evaluated using Spearman correlation coefficients. Table S3 shows the correlation coefficients calculated for the whole population for index plaques. Statistically significant correlations were obtained; however, these correlations were low, with values of less than 0.43.

As seen in Table S3, relationships exist between plaque mechanical properties and tissue echogenicity (or plaque area). Positive correlations were obtained between plaque cumulated axial translations and cumulated lateral translations, plaque cumulated axial shear strain magnitude, and plaque mean gray level or percentage of high-intensity gray level. This means that more movement or shear deformation is observed for more echogenic heterogeneous plaques. The negative correlations between the percentage of low-intensity gray level and the aforementioned mechanical parameters, including the cumulated axial strain, provide the same information; less echogenic homogeneous plaques correspond to less movements or deformations. Because hypoechoic plaques are associated with soft plaques and lipid necrotic cores, these correlative observations support the paradoxic association between soft plaques and lower strains by means of a damper effect reducing the deformation of the whole plaque, as was suggested in the Discussion section. Also notice the negative correlations between the maximal axial strain, maximum axial shear strain magnitude, and the plaque area.